March 16, 1926. 1,577,010

A. H. WHATLEY

ENGINE

Filed Oct. 26, 1925 2 Sheets-Sheet 1

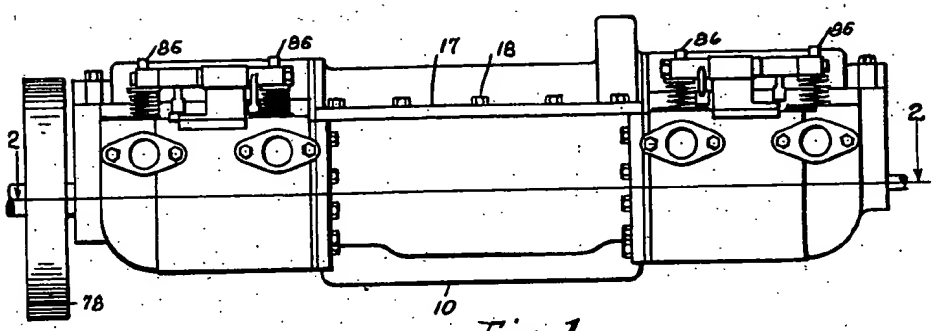

Fig. 1

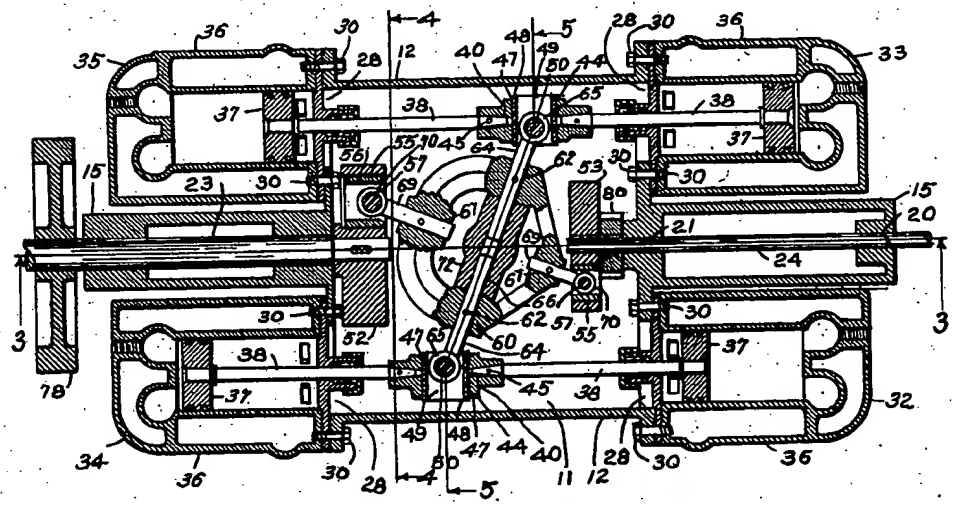

Fig. 2

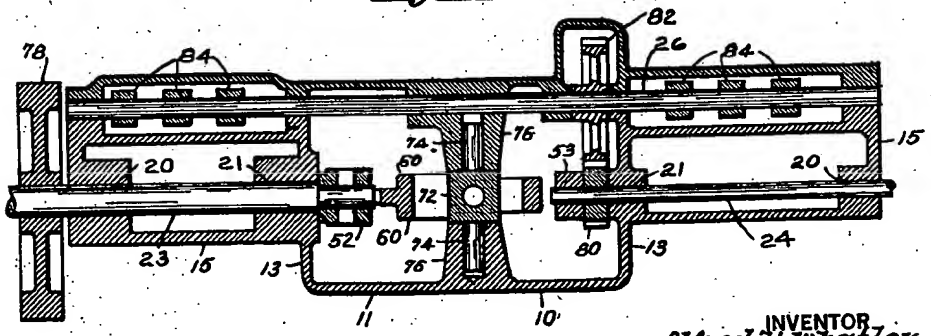

Fig. 3

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Filed Oct. 26, 1925 2 Sheets-Sheet 2

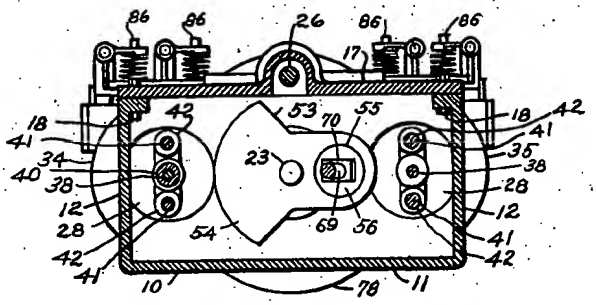


Fig. 4

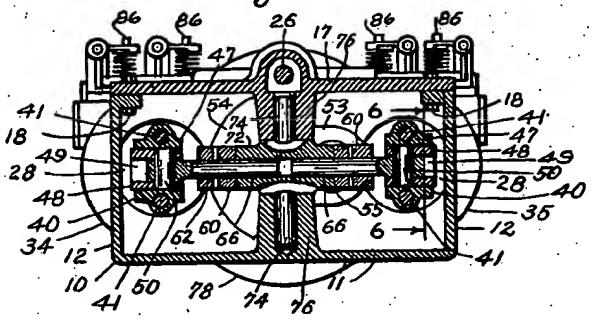


Fig 5

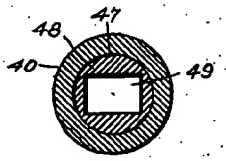


Fig. 6

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# UNITED STATES PATENT OFFICE.

ALFRED H. WHATLEY, OF PROVIDENCE, RHODE ISLAND, ASSIGNOR TO NEW ENGLAND MOTOR COMPANY, INCORPORATED, A CORPORATION OF RHODE ISLAND.

## ENGINE.

Application filed October 26, 1925. Serial No. 64,334.

*To all whom it may concern:*

Be it known that I, ALFRED H. WHATLEY, a citizen of the United States, residing at Providence, in the county of Providence and State of Rhode Island, have invented certain new and useful Improvements in Engines, of which the following is a specification.

My invention relates particularly to engines or motors in which opposed groups of cylinders drive the shaft or shafts through an oscillatory frame or yoke adapted to receive its immediate impulse from the pistons.

Certain objects of my invention are to convert the rectilinear motion of the reciprocating pistons to an oscillatory motion of the yoke, and to rotary motion of the shaft in a manner that will reduce strain or tension upon the yoke bearings, crossheads and crank disks; and to afford a more positive drive through the operating parts of the engine.

A further object is to avoid a construction requiring the employment anywhere in the engine of spherical members seated in spherical or hemispherical cups or bearings, whereby an accurate fitting of the parts is extremely expensive and usually impossible.

Further objects and advantages of the invention will be apparent as it is better understood from the following specification.

My invention consists in such parts and in such combinations of parts as fall within the scope of the appended claims.

In the accompanying drawings which form a part of this specification and which illustrates the principle of this invention in the best mode now known to me of applying this principle,

Figure 1 is a side elevation of an internal combustion engine of the opposed cylinder type in which my invention is embodied,

Figures 2 and 3 horizontal and vertical sections of the same on lines 2—2 of Figure 1, and 3—3 of Figure 2 respectively,

Figures 4 and 5, transverse sections of th same on lines 4—4 and 5—5 respectively of Figure 2, and

Figure 6, a section on line 6—6 of Figur 5.

Like reference characters indicate like parts throughout the views.

The engine is supported in a casing comprising a body section 10 comprising a bottom or base 11, sides 12, and ends 13, said ends being provided centrally with extensions 15. The casing is completed by a top section 17 fixed to the body section and extensions by bolts 18. Rotatably mounted in bearings 20 and 21 in the sections 15 in alignment with each other are a power driving shaft 23 and a second shaft 24 respectively. Journaled in the extensions 15 above the bearings is a single shaft 26. At both sides of the extensions 15 the ends 13 are cut away to allow the passage of pistons, as at 28. At these points are fixed to the ends 13 by bolts 30 four engine cylinders 32, 33, 34 and 35, all lying in the same horizontal plane and in the plane of the shafts 23 and 24. The first two cylinders are opposed to the second two. These cylinders are of uniform construction with casings 36 and pistons 37, piston rods 38 rigid with the pistons. The adjacent ends of the two pairs of piston rods, which are in alignment with each other, are connected by crossheads 40, slidable on guide rods 41 extending from the opposite cylinders through holes 42 in the heads. The crossheads have cavities 44 in their ends in which are rigidly fixed by pins 45 or otherwise the adjacent ends of the piston rods. Transversely of each crosshead is a bore or cylindrical opening 47 in which slides an exteriorly cylindrical block or bushing 48 with a transversely rectangular longitudinal passage 49 across which extends a pin or pivot member 50 fixed at its ends in the block.

Upon the adjacent ends of the shafts 23 and 24 are crank disks 52 and 53 respectively of similar construction. Each has a counterweighted peripheral extension 54 opposite a transverse eccentrically disposed bore or cylindrical opening 55, in which is slidably mounted a cylindrical block or bushing 56 identical in shape, operation and detailed construction with the bushings 48, and carrying similar pivot members 57 disposed transversely of their longitudinal passages.

The oscillatory member through which motion is transmitted from the pistons to the shafts comprises an pen substantially circular frame 60 provided with diametrically opposite aligned bores 62 in which are fixed intermediate their lengths rods or pins forming peripheral arms 64 and having sleeves 65 upon their outer ends pivoted

upon the members 50 with their ends in contact with the walls of the openings 49. The inner ends of these rods form a divided diametrical bearing 66. Diametrical bores 67 in the frame, at right angles to the bores 62, have fixed therein rods or pins 69 forming arms provided upon their outer ends with sleeves 70 loose on the pivot members 57. The bearing 66 is loose in a diametrically disposed sleeve 72 having trunnions 74 mounted in the bores of vertical tubular posts or bosses 76 upon the portions 11 and 17 of the casing.

The rectilinear reciprocation of the two pairs of rigidly connected piston rods imparts from the pistons circular reciprocatory motion to the frame 60 in a horizontal plane, while the freedom of the sleeve 72 upon the rigid pins 64 permits such movement of the frame in a vertical direction as to permit the pins 69 to describe cones while rotating the disks 52 and 53 to drive their respective shafts 23 and 24.

A balance wheel 78 is in this instance shown on the shaft 23. The piston driving mechanism may be operated from either of the shafts 23 and 24. In this instance a gear 80 on the shaft 24 drives a gear 82 on the shaft 26 which is provided with cams 84 for actuating the valve stems 86 in any usual or convenient manner.

It will be noted that in the construction shown no spherical or hemispherical bearings are required in the mounting of the frame 60, nor in the connections of the frame with the other portions of the engine mechanism, and that such connections are absent in every part of the engine. The absence of joints of such a character materially reduces the cost of engine construction, and the character, combinations, and arrangement of parts whereby the employment of such connections are avoided makes the drive more positive and lessens the strain upon the yoke bearings, crossheads, and crank disks.

I claim:—

1. In an engine of the type set forth, aligned shafts, opposed cylinders, pistons in the cylinders, piston rods on the pistons, crossheads connecting the piston rods provided with transverse bores, blocks slidably mounted in the bores, crank disks on the shafts provided with transverse bores, blocks slidably mounted in the bores, aligned tubular posts between the disks, a frame, radial arms upon the frame pivotally attached to all the blocks, a diametrical bearing fast in the frame, a sleeve loose on the bearing, and trunnions on the sleeve journaled in the posts.

2. In an engine of the type set forth, aligned shafts, opposed cylinders in the horizontal plane of the shafts, pistons in the cylinders, piston rods on the pistons, guide rods connecting the opposed cylinders, crossheads on the guide rods, crank disks on the shafts, a frame between the disks, arms upon the frame pivotally connected with the crosshead, arms on the frame pivotally connected with the disks, tubular posts arranged in alignment with each other above and below the frame, a diametrical bearing in the frame, a sleeve loose upon the bearing, and trunnions on the sleeve journaled in the posts.

3. In an engine of the type set forth, aligned shafts, opposed cylinders on both sides of the shafts, pistons in the cylinders, piston rods on the pistons, crossheads uniting the adjacent ends of the pistons provided with transverse bores, cylindrical blocks slidably mounted in the bores provided with central passages, pivot pins in the blocks disposed transversely of the passages, disks upon the inner ends of the shafts provided eccentrically with transverse bores, cylindrical blocks slidably mounted in the second bores, a frame between the disks, arms upon the frame, sleeves upon the arms loosely embracing the pivot pins, arms upon the frame pivotally engaging the second blocks, a bearing fixed in the frame, tubular posts disposed above and below the frame, a sleeve on the bearing, and trunnions on the sleeve extending into the posts.

4. In an engine of the type set forth, aligned shafts, opposed cylinders adjacent the shafts, pistons in the cylinders, piston rods on the pistons, crossheads uniting the adjacent pistons, disks upon the shafts provided eccentrically with transverse bores, blocks slidably mounted in the bores provided with central passages, pivot pins in the blocks disposed transversely of the passages, a frame between the disks, arms upon the frame pivotally connected with the crossheads, arms upon the frame disposed at right angles to the first arms, sleeves upon the second arms engaging the pivot pins, a bearing in the frame, tubular posts adjacent the frame, a sleeve on the bearing, and trunnions on the sleeve journaled in the posts.

5. In an engine of the type set forth, aligned shafts, opposed cylinders on both sides of the shafts, pistons in the cylinders, pison rods on the pistons, crossheads connecting the adjacent ends of the pistons provided with transverse bores, blocks slidably mounted in the bores provided with transversely rectangular longitudinal passages, pivot pins in the blocks disposed transversely of the passages, disks upon the inner ends of the shafts provided eccentrically with transverse bores, blocks slidably mounted in the second bores provided with transversely rectangular longitudinal passages, pivot pins in the second blocks extending transversely of the second

passages, a frame between the disks, arms upon the frame, sleeves upon the arms loosely embracing the pivot pins in the crossheads, arms upon the frame disposed at right angles to the first arms loosely surrounding the pivot pins in the disks, a diametrically disposed bearing in the frame, tubular posts disposed above and below the frame, a sleeve loose on the bearing, and trunnions on the sleeve journaled in the posts.

In testimony whereof I have affixed my signature.

ALFRED H. WHATLEY.